



# INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

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OMB # (1024-0236)  
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Form No. (10-226)

<b>Reporting Year:</b> 2007	<b>Park:</b> Klondike Gold Rush NHP	<b>Select the type of permit this report addresses:</b> Scientific Study
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<b>Study Title (maximum 300 characters):</b> Scale and distribution of global pollutants (mercury and POPs)in Southeast Alaska Network park watersheds			
<b>Park-assigned Study or Activity #:</b> KLGO-00006	<b>Park-assigned Permit #:</b> KLGO-2007-SCI-0005	<b>Permit Start Date:</b> Jun 01, 2007	<b>Permit Expiration Date:</b> Sep 30, 2007
<b>Scientific Study Starting Date:</b> Jun 01, 2007		<b>Estimated Scientific Study Ending Date:</b> Sep 30, 2007	
<b>For either a Scientific Study or a Science Education Activity, the status is:</b> Continuing		<b>For a Scientific Study that is completed, please check each of the following that applies:</b>  <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years  <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park  <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
<b>Activity Type:</b> Research			
<b>Subject/Discipline:</b> Water Quality			

<b>Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):</b> The main goal of this project is to conduct a contaminants survey in freshwater fish, benthic macroinvertebrates (BMI), streambed sediments, and stream water in two rivers that are part of Klondike Gold Rush National Historic Park (KLGO). The harmful effects of mercury (Hg) and persistent organic pollutants (POPs) in the environment is well established. However, there is scarce information on these pollutants in southeast Alaska, although the limited data indicate they may be present at high concentrations (Day et al., 2004; Fitzgerald et al., 2006; Vander Pol et al., 2004). While local emission sources are insignificant, global sources of Hg and some forms of POPs are projected to continue rising. In particular, the rapid economic expansion of China, whose energy needs are being met by extensive Hg-laced coal burning, is suspected to be leading to large increases in Hg export to Alaska via atmospheric transport pathways (Streets et al., 2005). Both Hg and POPs are highly volatile and tend to become concentrated at high latitudes due to atmospheric circulation patterns and polar temperature controls (AMAP, 2002; Pacyna and Pacyna, 2002). In addition, salmon and birds may act as powerful biovectors of these contaminants; accumulating them in oceans and distant source areas and depositing them
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in riparian areas as they pass through to spawn or migrate (Blais et al., 2007). This project would provide original data that would evaluate the current scale of these contaminants in KLGO freshwater streams, examine the landscape patterns that explain their distribution, and also pertain to the Vital Signs program by serving as a baseline data set to which future contaminants monitoring can be compared.

**Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):**

On July 3, 2007, we visited 2 streams in or adjacent to Klondike Gold Rush National Park and Preserve and collected samples according to our permits and study proposal. Streams visited were the Taiya and Skagway Rivers, both at sites near their mouths. The Taiya River sample site was at the USGS gaging station and bridge crossing; the Skagway River site was accessed from the town of Skagway immediately upstream of the old rail station (as far upstream as we could access by foot from the east side of town). Although the Skagway River site is downstream of the NPS Skagway unit, we sampled it near the mouth in an attempt to characterize the water quality from an integrated watershed perspective. At each site, we (John Hudson and Sonia Nagorski) took in situ water quality measurements; collected 4 liters of water; several grams of streambed sediments, up to 100 mayfly larvae, and up to 16 juvenile coho salmon. Each site sampling visit took between 2-4 hours to complete, and we sampled both streams on the same day.

Water samples were split between USGS water quality labs (for chemical analyses) and to the University of Alaska Southeast (for sediment quantification). Most aquatic insect samples were sent to the USGS Wisconsin District Mercury Laboratory (WDML) for mercury analyses; the remaining fraction was preserved and used for genus or species-level identification by John Hudson in Juneau, AK. Half of the fish samples and all of the streambed sediment samples were sent to the WMDL for total mercury and methylmercury concentration determination. The other half of the fish samples was sent to the NOAA Northwest Fisheries Science Center in Seattle, WA for analyses of persistent organic pollutants (POPs).

Preliminary results are available to date only for in-situ water quality parameters (pH, dissolved oxygen, specific conductance, temperature, turbidity), total suspended solids, water chemistry, as well as insect identification. Results of total and methylmercury concentrations in sediment, insects, and fish, and for POPs in fish, are still pending from the analytical labs.

Our data from the Taiya and Skagway Rivers will be much more informative when we integrate them with our data results from the other 15 streams sampled within the Southeast Alaska Network (SEAN)—one from Sitka National Historic Park and 14 from Glacier Bay National Park and Preserve. We will use our composite dataset to evaluate the distribution of total mercury and methylmercury in the landscape, and we will consider the role of wetland-dominated environments in particular. Initial evaluation of the water data indicates that mercury concentrations in the Taiya and Skagway River were among the lowest in the SEAN (total mercury concentrations: 0.35 and 0.37 ng/L, respectively). Neither stream contained detectable ( $>0.04$  ng/L) filtered methylmercury. Turbidity and total suspended sediment (TSS) were moderately high in these streams on the sample date (TSS: 34.7 and 24.3 mg/L; and turbidity of 29 and 22 NTU, for the Taiya and Skagway, respectively) reflecting the glacial melt influence on the streams. Of the in situ parameters measured, dissolved oxygen (14.0 and 13.4 mg/L), pH (6.81 and 6.76), specific conductance (0.029 and 0.033), and temperature (4.48 and 6.91°C) were very similar in the Taiya and Skagway Rivers. Acid neutralizing capacity was also similar between the 2 streams (248 vs 260 uEQ/L), as were dissolved organic carbon (0.8 and 1.2 mg/L) and the suite of cations (ammonium, calcium, magnesium, sodium) and anions (chloride, nitrate, sulfate, phosphate). All water quality parameters measured indicate that both streams are well-oxygenated, well-buffered, are of generally very good water quality. More complex relationships among variables, and in particular how they related to mercury levels in water, sediment, aquatic insects, and fish will be explored when the remaining data are received from the labs.

**For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?**

Yes

**Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):**

\$13,463.00

**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**

\$0.00

**List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:**

**For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?**

Yes

**If "Yes", identify where the specimens currently are stored:**

Aquatic insects (mayflies, up to 100 individuals) are preserved in ethanol and stored with John Hudson for genus/species level identification.

**Paperwork Reduction Act Statement:** A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information form is estimated to average 1.38 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3130 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.

**Privacy Act Notice:** Scientific research, education and collecting activities within units of the National Park System that may impact parks invoke a permitting and reporting requirement per regulations at 36 CFR 1.6 (Permits), 36 CFR 2.1 (Preservation of Natural, Cultural and Archeological Resources), and 36 CFR 2.5 (Research Specimens). The National Park Service collects information about permit applicants and permittees to administer and document research, collecting, and reporting activities within parks. The information disclosed on this form is required and may result in denial of permit applications if not provided.